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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/699,839	11/04/2003	Edward Y. Chang	CHAN3228/EM	4041
23364	7590	06/20/2005	EXAMINER	
BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			TRAN, MAI HUONG C	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 06/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/699,839

Applicant(s)

CHANG ET AL.

Examiner

Mai-Huong Tran

Art Unit

2818

(Handwritten signature)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 14-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>3/04 6/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restriction

Application's election without traverse of Group II (Claims 1-13) drawn to process of making a semiconductor device is acknowledged for prosecution in the subject application. Accordingly, claims 14-18 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Applicants have the right to file a divisional application covering the subject matter of the non-elected claims.

Specification

The specification is objected to for the following reasons.

The specification and the abstract includes typographical errors, e.g. 'heteroepitaixial, epitaixial'. It should be 'epitaxial'. Correction is required.

On page 4, line 24, grammatical error has been found, e.g., 'each layers is'. Correction is required.

On page 5, line 2, typographical error has been found, e.g., 'prior orts'. Correction is required.

Claim Objections

Claims are objected to because of the following reasons.

Claims include typographical errors, e.g. 'epitaixial'. It should be 'epitaxial'.

Appropriate correction is required.

Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-13 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent Application Publication No. 2004/0031979 to Lochtefeld et al. in view of Chen et al. (6,893,936) and further in view of the remark.

Regarding to claim 1, Lochtefeld discloses a process for growing a GaAs epitaxial layer on Ge/SiGe/Si substrate comprising steps of (1) providing a clean silicon wafer 12; (2) growing a first SiGe epitaxial layer 14 with a certain thickness, which the layer comprises at least 70 wt. % of Ge (page 4, [0062]); (3) performing in-situ high temperature annealing for the first layer; (4) growing a second layer 16 which the Ge content (page 4, [0063]) is more than that of the first one (the first SiGe layer 14 in Lochtefeld comprises a maximum Ge content of 10-80% that can be set to 70%, and the

second layer has a Ge content of 10-80% that can be set to 80%). During each of two growing periods, performing in-situ high temperature annealing for those layers (page 2, [0024]); (5) growing a pure Ge film 18 on the epitaxial layer from step (4); (6) finally, growing GaAs epitaxy on the Ge film (page 4, [0065]). Locktefeld does not disclose step (3) of performing in-situ high temperature annealing for the first layer.

However, Chen teaches the step of performing in-situ high temperature annealing for the first layer (col. 4, lines 50-57).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the step of performing in-situ high temperature annealing for the first layer in order to achieve the required total Si/SiGe thickness without exceeding the critical thickness of the strained layer (col. 3, lines 43-45).

Regarding to claim 2, Locktefeld discloses the process, wherein, in steps (1) to (5), the Ge content of epitaxial layers, from the first layer, the second and/or third layer to a pure Ge film as the topmost layer, is stepwise increasing, and their growth is carried out at a temperature of from 350 to 650.degree. C., growth gases having pressure of from 20 to 100 m-Torr by using ultra-high vacuum chemical vapor deposition; in addition, in step (6), growing for GaAs epitaxy is carried out at a temperature of 600.degree. C. by using metal organic chemical vapor deposition and the growth time depends on the device requirement (page 4, [0066]).

Regarding to claim 3, Loctefeld in view of Chen discloses the claimed invention except for the process wherein the first SiGe epitaxial layer is Si.sub.0.1Ge.sub.0.9 which has a thickness of at least 0.1 .mu.m.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the first SiGe epitaxial layer is Si.sub.0.1Ge.sub.0.9 which has a thickness of at least 0.1 .mu.m, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Claim 4 is rejected under the same rationale set forth above to claim 3.

Claim 5 is rejected under the same rationale set forth above to claim 1 or 2.

Claim 6 is rejected under the same rationale set forth above to claim 5.

Claim 7 is rejected under the same rationale set forth above to claim 1 or 2.

Claim 8 is rejected under the same rationale set forth above to claim 7.

Regarding to claim 9, Lochtefeld discloses the process, wherein the first SiGe epitaxial layer can comprise 70 to 90 wt. % of Ge (page 4, [0062]).

Regarding to claim 10, Lochtefeld discloses the process, wherein the second SiGe epitaxial layer can comprise 80 to 95 wt. % of Ge (page 4, [0063]).

Regarding to claim 11, Lochtefeld discloses the process, wherein growing for epitaxy layer is carried out at a temperature of 400.degree.C (page 4, [0066]).

Regarding to claim 12, Chen discloses the process, wherein in-situ high temperature annealing is performed at a temperature of 750.degree. C. in at least 5 min (col. 6, lines 10-12).

Regarding to claim 13, Lochtefeld in view of Chen discloses the claimed invention except for the process wherein the atmosphere of in-situ high temperature annealing is hydrogen with a pressure of 20 m-Torr.

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to form the process wherein the atmosphere of in-situ high temperature annealing is hydrogen with a pressure of 20 m-Torr, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).


Conclusion

Any inquiry concerning this communication on earlier communications from the examiner should be directed to Mai-Huong Tran, (571) 272-1796. The examiner can

normally be reached on Monday-Thursday from 8:00 AM to 6:30 PM. The examiner's supervisor, David Nelms can be reached on (571) 272-1787.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to be 'NH' or similar, located at the bottom left of the page.A handwritten signature in black ink, appearing to be 'Mai-Huong Tran', located at the bottom right of the page.
Mai-Huong Tran